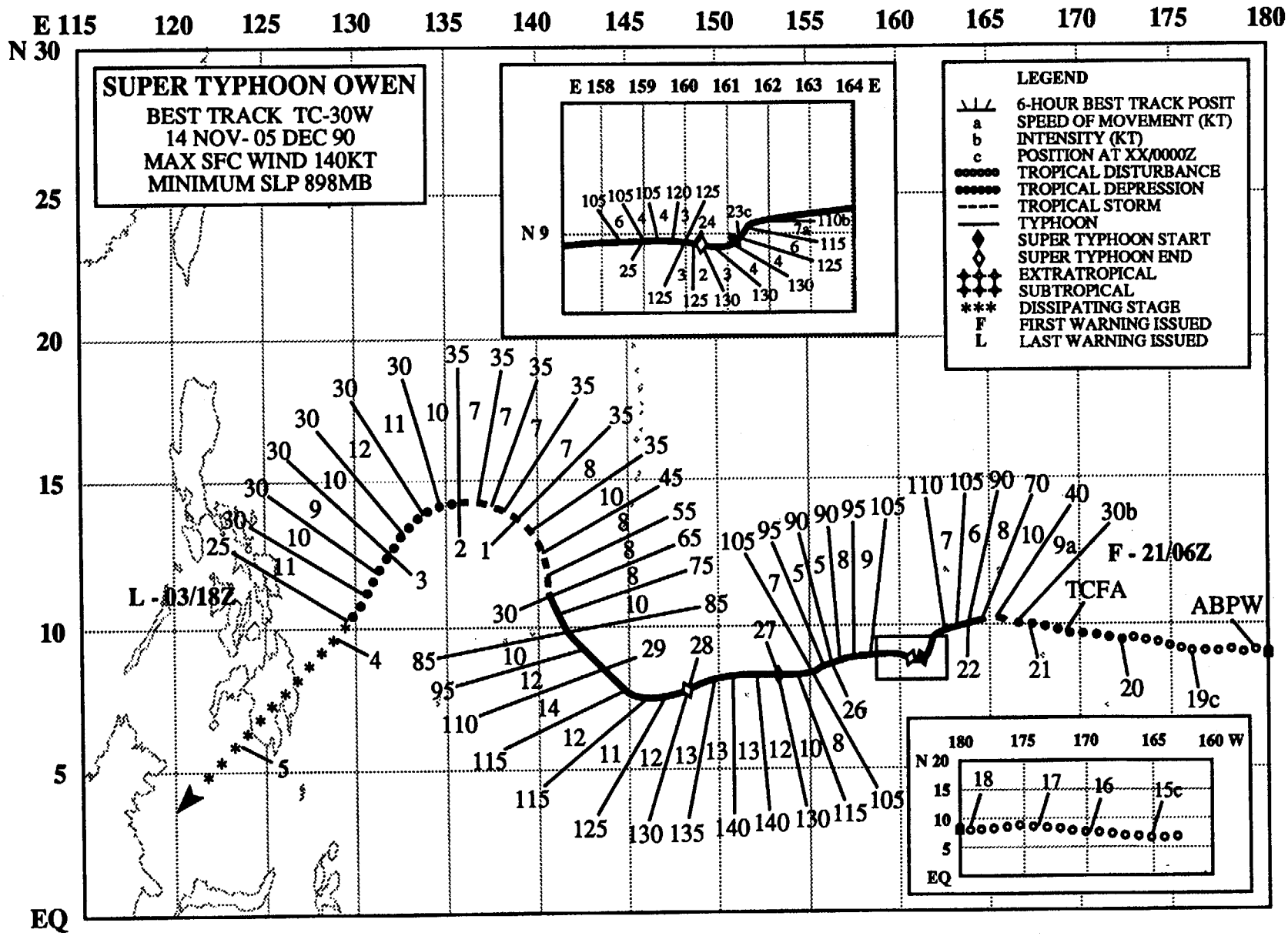

SUPER TYPHOON OWEN
BEST TRACK TC-30W
14 NOV- 05 DEC 90
MAX SFC WIND 140KT
MINIMUM SLP 898MB
LEGEND
6-HOUR BEST TRACK POSIT
SPEED OF MOVEMENT (KT)
INTENSITY (KT)
POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
SUBTROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
L - 03/18Z
F - 21/06Z
TCFA
ABPW
E 115 120 125 130 135 140 145 150 155 160 165 170 175 180
N 30 25 20 15 10 5 EQ
E 158 159 160 161 162 163 164 E
N 9
180 175 170 165 160 W
N 20 15 10 5 EQ

SUPER TYPHOON OWEN (30W)

I. HIGHLIGHTS

Owen was both the longest lasting and one of the most interesting tropical cyclones of 1990. It started to rapidly intensify while still a tropical depression, explosively deepened to super typhoon intensity, weakened and then reintensified to a super typhoon. Owen started as a discrete cloud mass southwest of Hawaii, maintained its integrity as it tracked westward in the trade wind trough, but did not intensify until it crossed the date line and passed north of Kwajalein in the Marshall Islands. It then reached typhoon intensity in less than 18 hours and continued westward over the central Caroline Islands where it weakened and reintensified. Its deep convection sheared away southeast of Ulithi Island in the western Carolines. The exposed low-level remained organized for six more days as it moved north, then west, and finally southwestward before dissipating over the Celebes Sea after crossing Mindanao.

II. HIGHLIGHT OF EVENTS

180600Z - First mentioned on Significant Tropical Weather Advisory as an area of persistent convection with maximum sustained surface winds estimated at 10-15 kt (5-7 m/sec) and a minimum sea-level pressure estimated at 1006 mb.

201400Z - Tropical Cyclone Formation Alert based on increased organization of central convection and improved outflow.

210600Z - First warning due to improved upper- and lower-level organization, increased deep convection, increasing wind speeds in the synoptic data, and a CI 2.5.

211200Z - Upgrade to tropical storm based on continued improvement in organization, increased deep convection, and good symmetrical outflow in all quadrants.

211800Z - Upgraded to typhoon following development of a 20 nm (35 km) diameter circular eye, continued rapid intensification, and a CI 4.0.

230600Z - Upgrade to a super typhoon based on continued warming of eye temperature and a CI 6.5.

240000Z - Downgrade to typhoon intensity based on observed vertical wind shear and restricted outflow in all quadrants except the southwest.

270000Z - Upgrade to super typhoon intensity based on warm eye temperature, cold surrounding convective cloud tops and a Dvorak current intensity estimate of 6.5.

280000Z - Downgrade to typhoon intensity based on increased vertical wind shear and restricted outflow to the east.

300600Z - Downgraded to a tropical storm due to increased vertical wind shear and exposed low-level circulation.

020600Z - (December) Downgrade to a tropical depression based on lack of deep central convection and decreased organization.

031800Z - Final warning followed further decrease in cloud organization and associated convection.

III. TRACK & MOTION

Owen developed out of a convective cluster 860 nm (1590 km) southwest of Hawaii near Palmyra Island, and was initially mentioned on a CPHC advisory. The system tracked westward across the central Pacific embedded in the tradewinds south of the subtropical ridge. It continued on this track until it reached the western Marshall Islands. Owen then slowed and tracked southwestward on 22 and 23 November as it approached an anticyclone located to the northwest (Figure 3-30-1). By 24 November, the omega block near the date line had dissipated and the mid-latitude westerlies returned to a more zonal flow. Owen then tracked west-southwestward along the

southern side of the subtropical ridge until 28 November. At that time, the typhoon entered an area dominated by broad low-level westerlies flowing into the recurving Typhoon Page (29W) (Figure 3-30-2). Owen's deep convection sheared apart late on 29 November and revealed an exposed low-

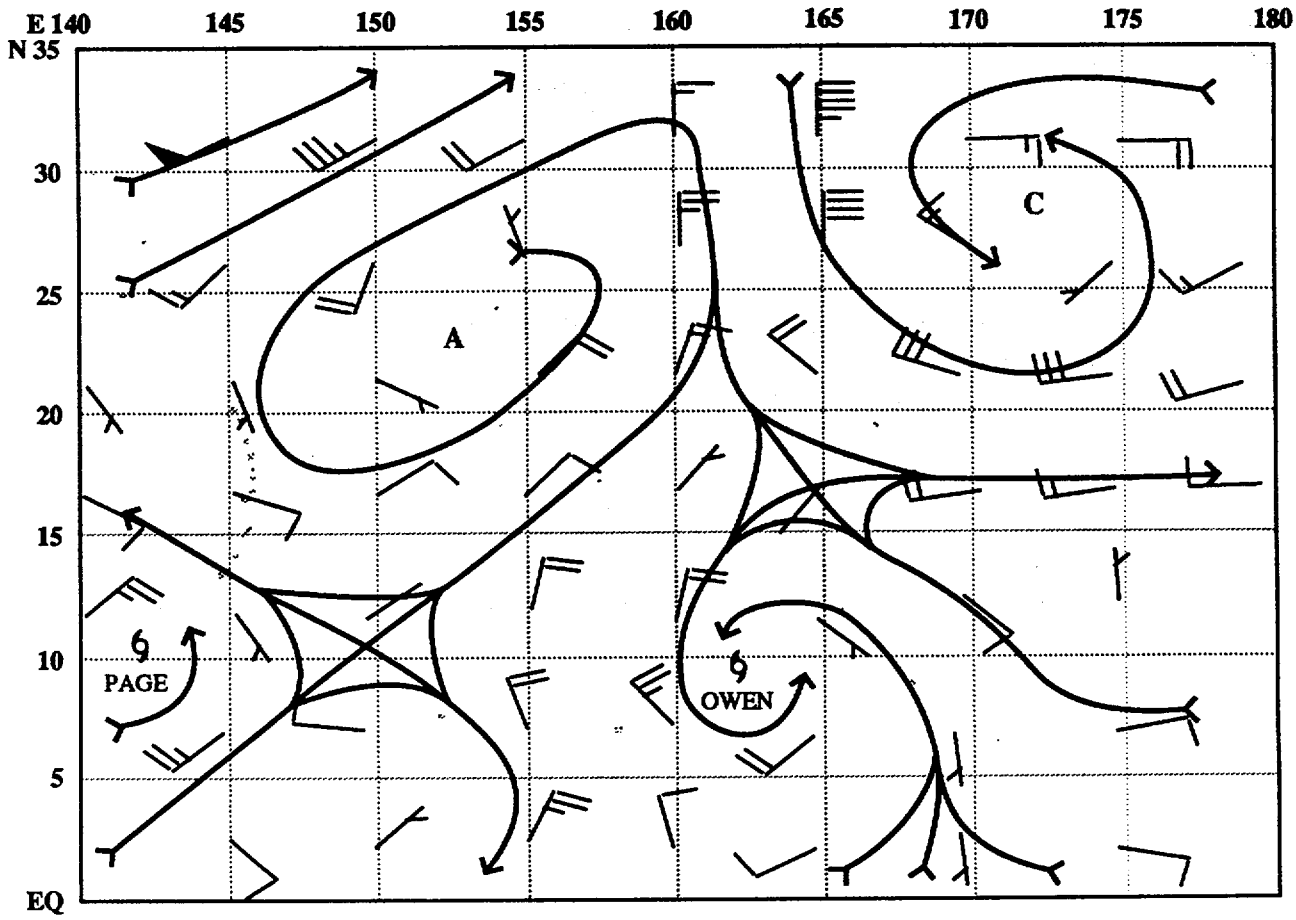


Figure 3-30-1. The 221200Z November NOGAPS 500-mb analysis shows an anticyclone to the northwest of Owen. The cyclonic circulation to the northeast of Owen is part of an omega block.

level circulation to the east of the major convection (Figure 3-30-3). This low-level circulation then tracked around the western periphery of the subtropical high until it encountered a shear line. Then, it turned southwestward, tracked down the shear line, and dissipated over the Celebes Sea on 05 December.

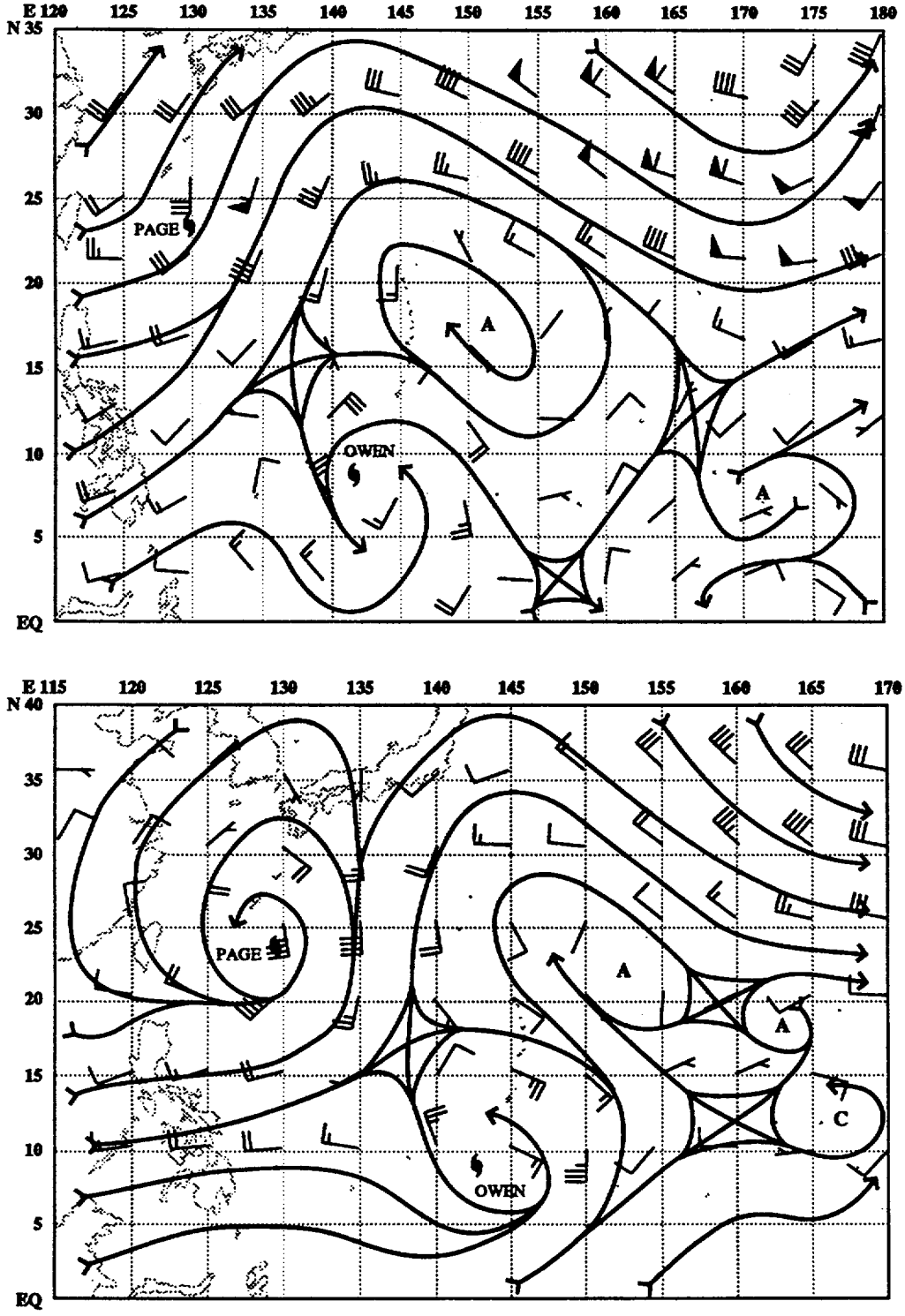


Figure 3-30-2. The 290000Z November NOGAPS analyses: a) for 500 mb depicting Owen near the western periphery of the subtropical high, and b) for 700 mb showing the deep westerly flow associated with Page (29W) which is located to the northwest of Owen.

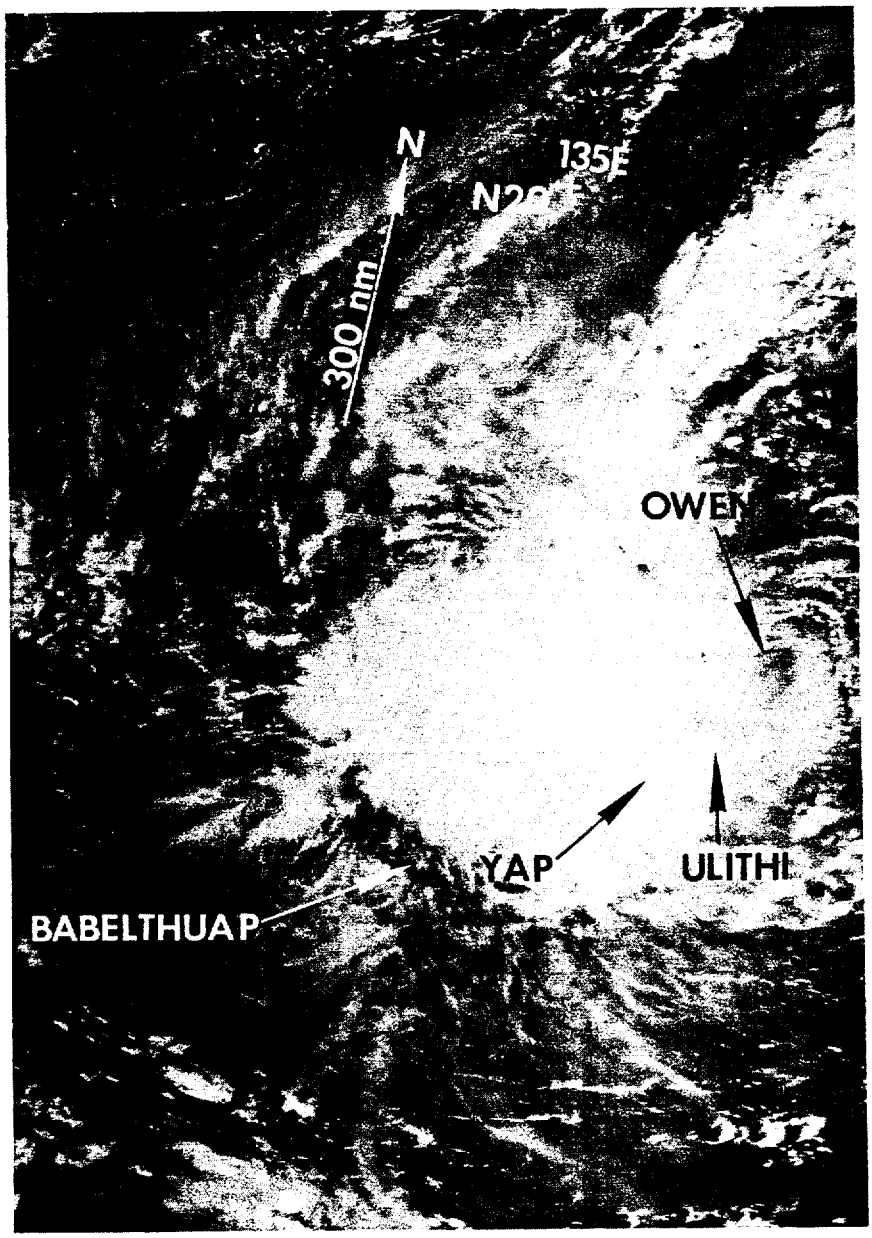


Figure 3-30-3. As Owen shears apart, the low-level circulation center appears to the east of the deep convective mass (300529Z November NOAA visual imagery).

IV. INTENSITY

The convective cloud mass that eventually became Owen formed southwest of Hawaii near Palmyra Island and maintained its continuity as it tracked across the central Pacific and past the date line. A discernible low-level circulation persisted, but the upper-levels did not favor further development. On 20 November, the convection flared and the overall organization started to improve as Owen entered an area of upper-level divergence and lighter winds (Figure 3-30-4). By 21 November, there were signs of an upper-level anticyclone forming over the disturbance and by the time of the second warning, surface pressures started dropping rapidly (Figures 3-30-5). By warning number 3, Owen had developed a 20 nm (35 km) diameter symmetric eye (Figure 3-30-6) and was well into its explosive intensification phase. Although tropical cyclones normally experience explosive intensification after reaching near typhoon intensity (Dunnavan, 1981), Owen commenced explosive intensification as a tropical depression, experiencing a drop in central pressure of 62 mb in 24 hours. Early stage development was supported by surface observations in

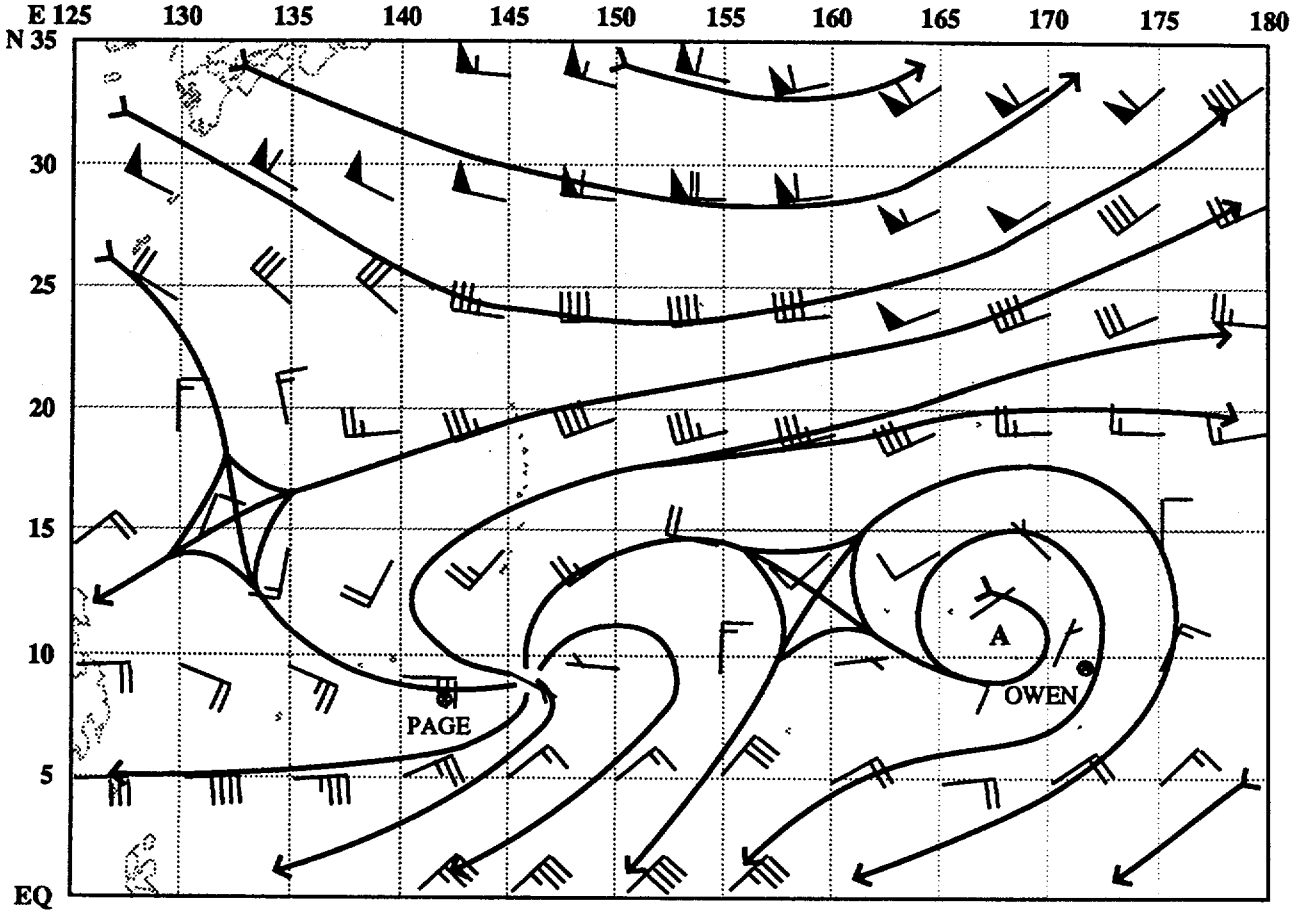


Figure 3-30-4. The 200000Z November 200-mb analysis shows Owen entering an area of lighter winds aloft.

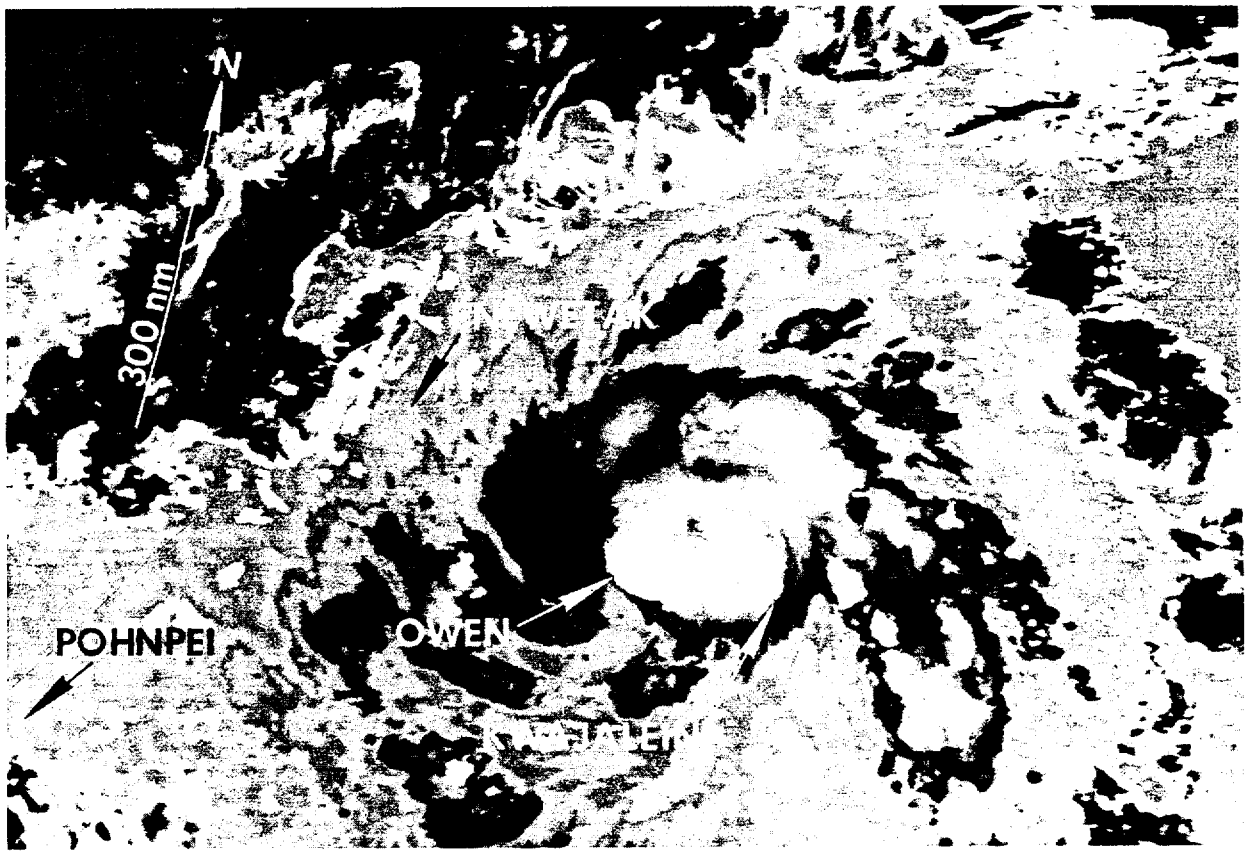


Figure 3-30-5. Tropical Storm Owen starting its explosive intensification phase (210822Z November DMSP enhanced infrared imagery).

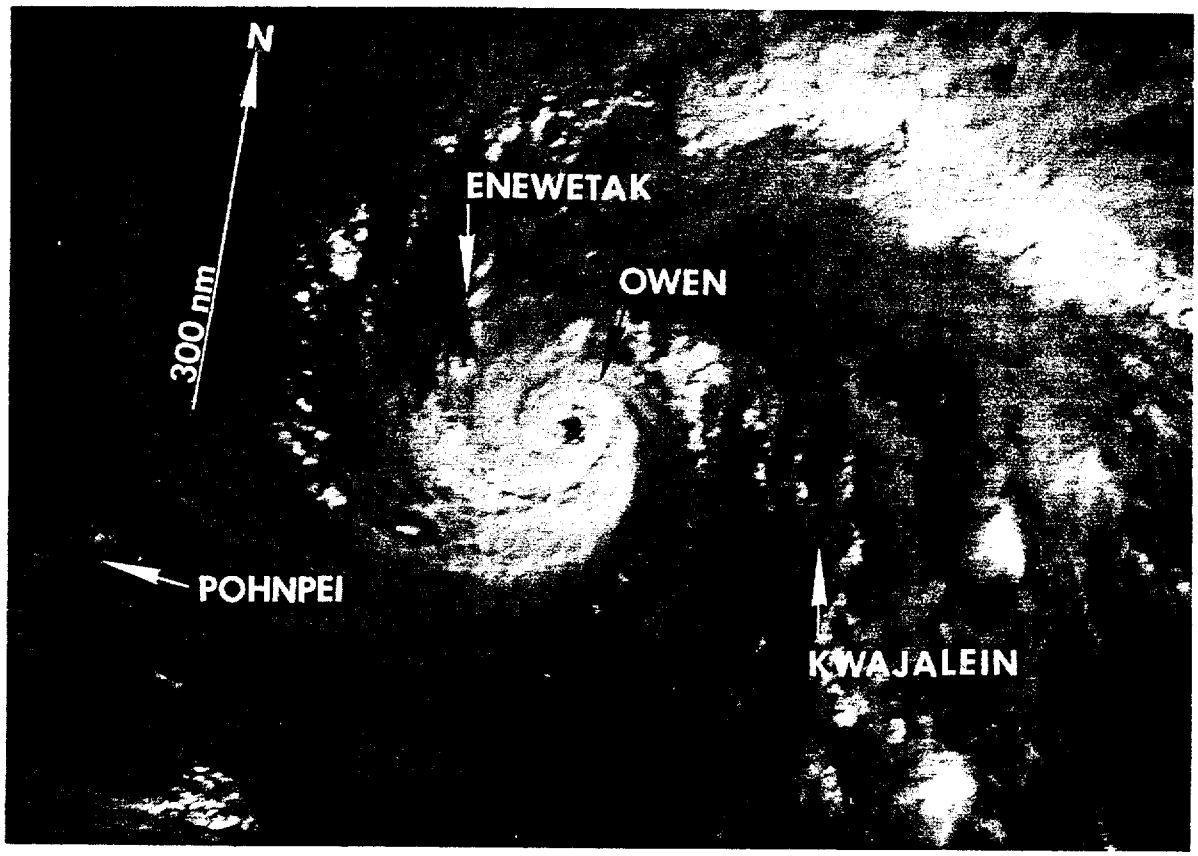


Figure 3-30-6. Fourteen hours after Figure 3-30-5, Owen has a symmetrical 20 nm (35 km) diameter eye and has reached typhoon intensity (212229Z November DMSP visual imagery).

the Marshall Islands and by radar observations from Kwajalein. Owen intensified from 30 kt (15 m/sec) to 105 kt (54 m/sec) in 24 hours, and peaked at 130 kt (67 m/sec) in 48 hours (Figure 3-30-7). Upon reaching super typhoon intensity (Figure 3-30-8), Owen moved into an area of increasing vertical wind shear and its outflow channel to the north was suppressed and eventually cut off by the convergence associated with a passing mid-latitude trough and the eastern side of the anticyclone located between Owen and Typhoon Page (29W). The vertical wind shear eased on 26 November

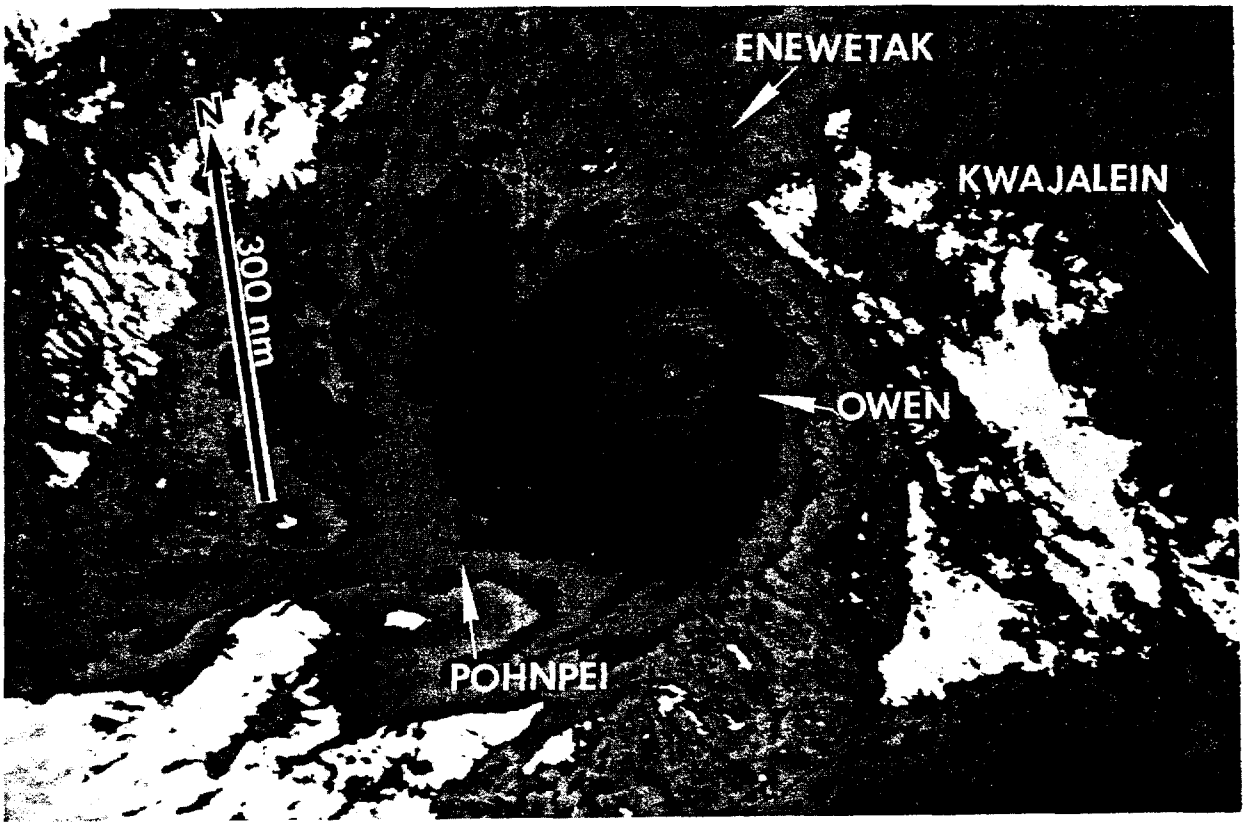


Figure 3-30-7. Super Typhoon Owen near its first peak in intensity (231048Z November DMSP enhanced infrared imagery).

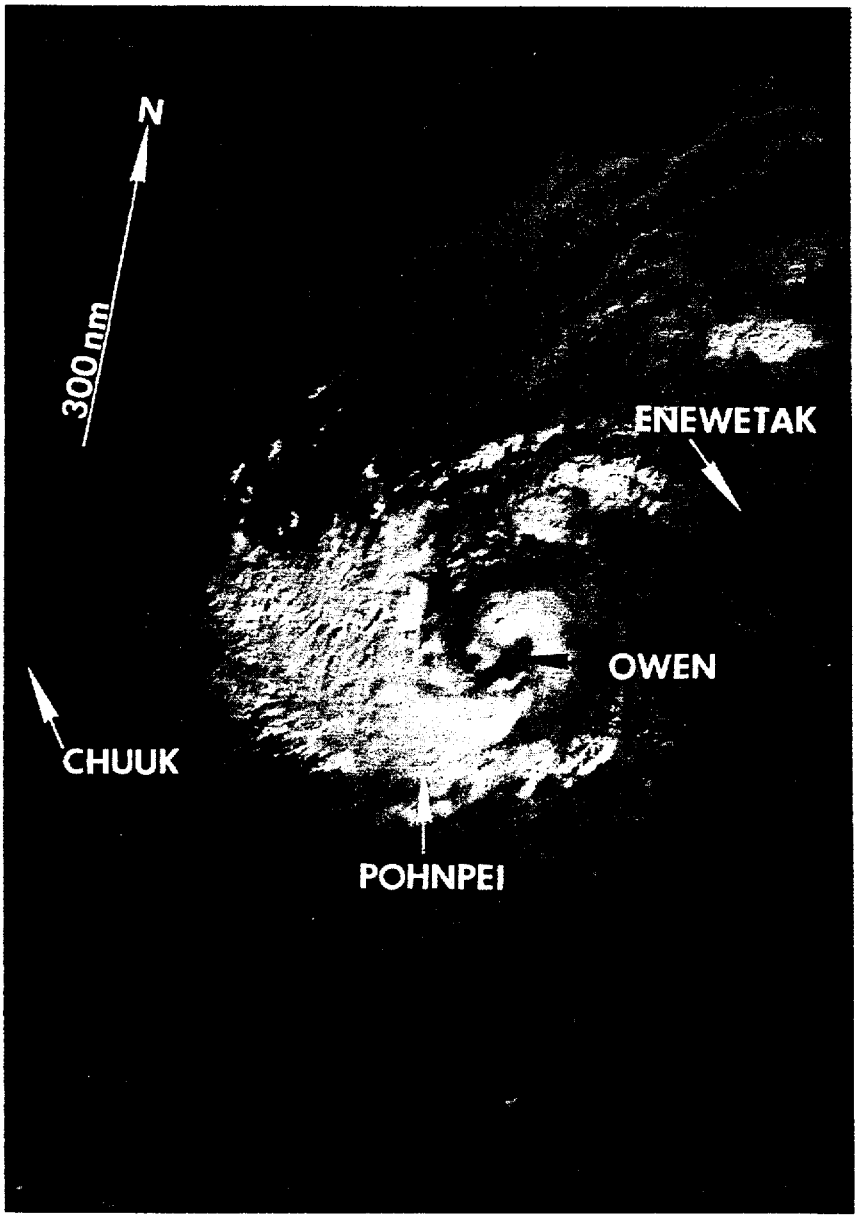


Figure 3-30-8. Shear from the northeast and restricted outflow to the north are evident, as Typhoon Owen weakens (242307Z November DMSP visual imagery).

permitting Owen to reintensify (Figure 3-30-9). The peak intensity of 140 kt (72 m/sec) was reached on 29 November and there was a significant shift in the position of the upper-level anticyclone (Figure 3-30-10). As the anticyclone shifted position, the upper-level shear from the east increased dramatically from approximately 10 kt to 40 kt. This environment persisted until Owen sheared apart late on 29 November with the upper-level convection continuing west-northwestward and the low-level circulation center moving north-northwestward. Owen never moved back into a environment favorable for redevelopment and only maintained scattered convection until it dissipated in the Celebes Sea (Figure 3-30-11).

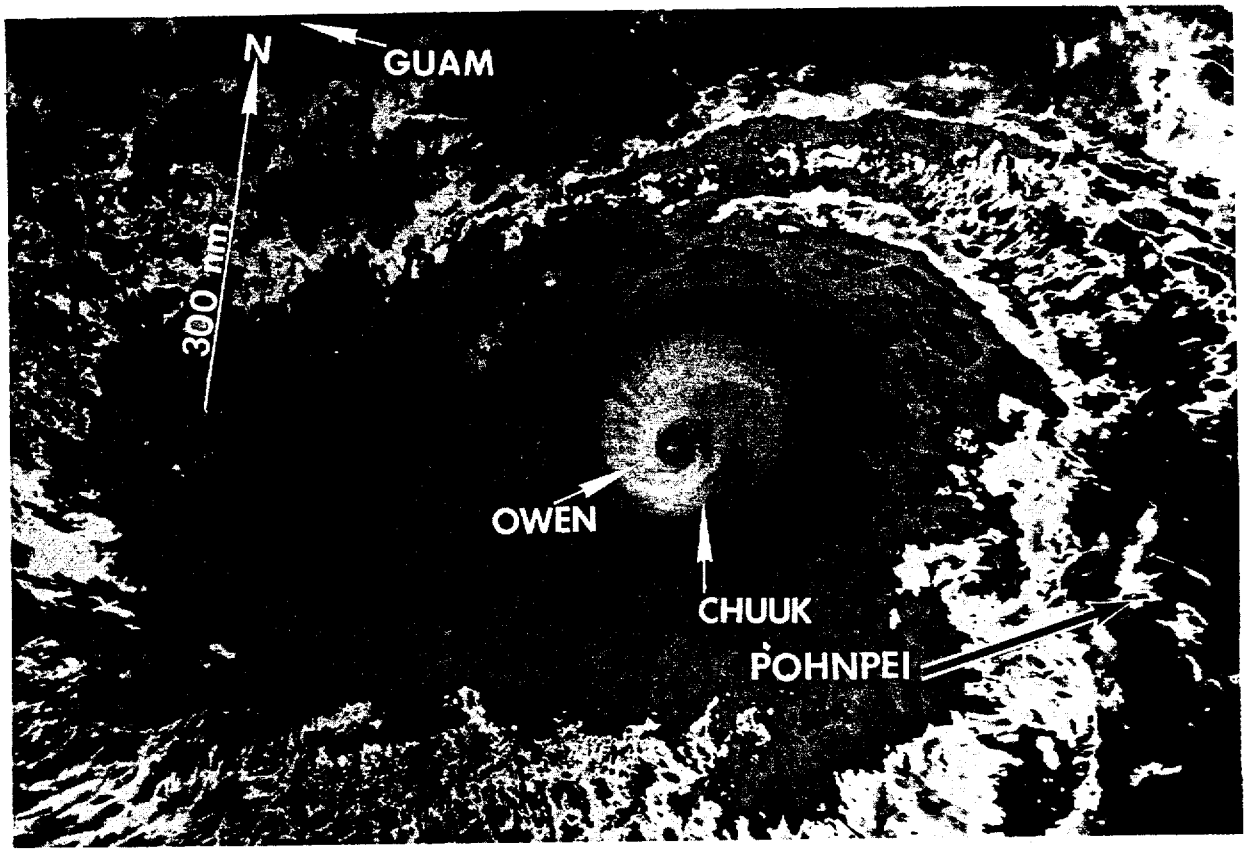
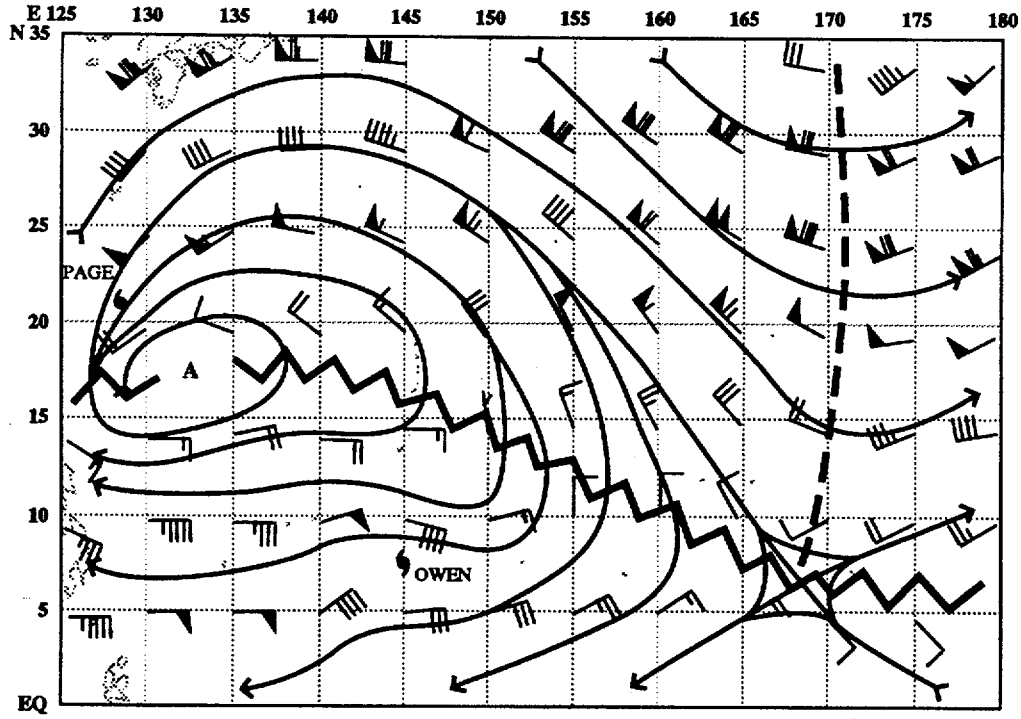
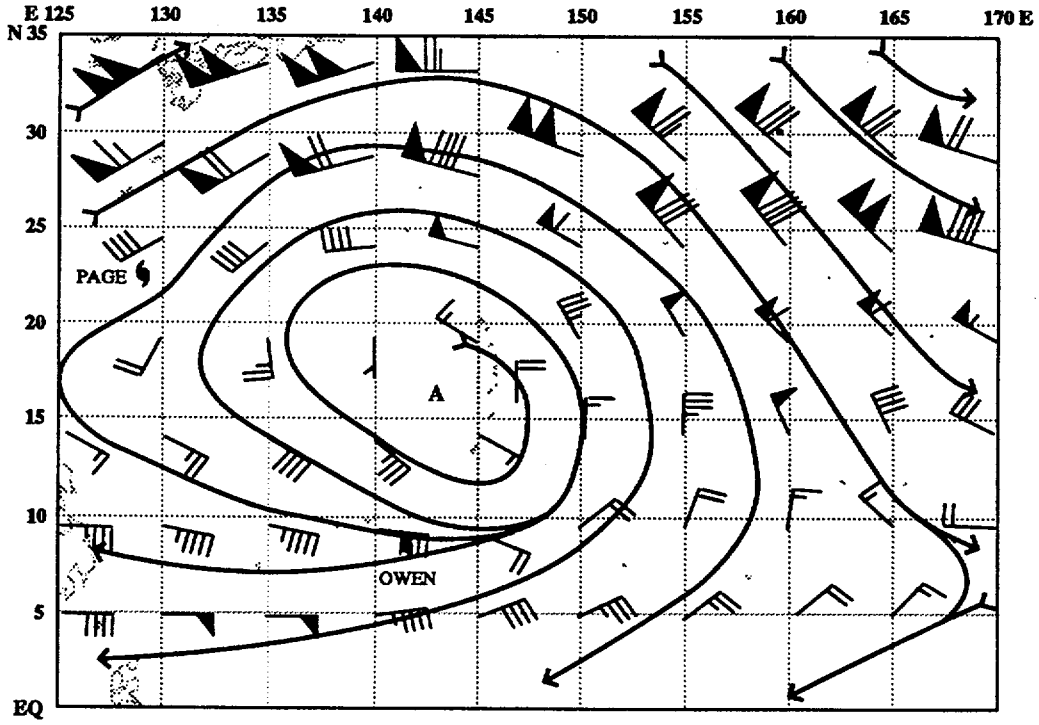


Figure 3-30-9. Owen after reintensifying to super typhoon intensity for a second time (270925Z November NOAA enhanced infrared imagery).



a)



b)

Figure 3-30-10. The November NOGAPS 200-mb analyses: a) for 281200Z November showing Page (29W) and the center of the anticyclone to the northwest of Owen, and b) for 290000Z November showing the relocation of the center of the anticyclone to the north of Owen.

V. FORECASTING PERFORMANCE

JTWC's forecast performance is shown in Figure 3-30-12. Overall errors for this system were well below the long term average because JTWC did well forecasting the speed and speed changes exhibited by Owen. JTWC forecasts were generally right of track until 28 November for a number of reasons. First, the usually dependable NOGAPS deep layer mean provided guidance that indicated northwestward movement. Second, Owen took an anomalous track to the west-southwest. Finally, NOGAPS after 26 November consistently forecast the anticyclone steering Owen to reposition itself east of Guam sooner than the 29 November timeframe when the shift actually occurred. JTWC forecast recurvature early as a result, and the recurvature forecast had to be adjusted back to the west. Once Owen sheared, forecast guidance was based on the NOGAPS 700 mb and lower levels. JTWC accurately forecast the initial peak intensity and the subsequent weakening. The reintensification was correctly reflected in the forecasts, but the maximum intensity was under forecast. Since Owen was not forecast to shear apart, the final weakening trend was significantly faster than forecast.

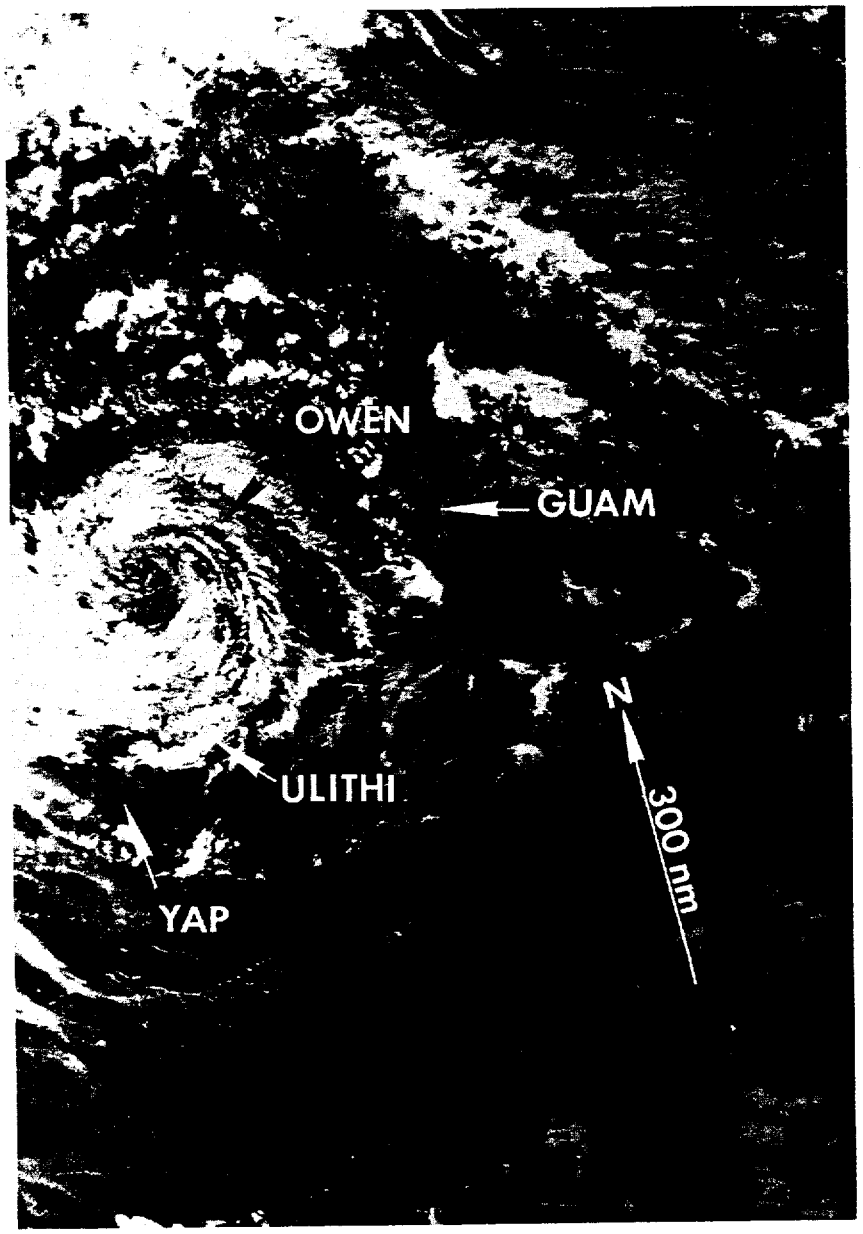


Figure 3-30-11. Owen's low-level circulation is fully exposed (301632Z November NOAA infrared imagery).

VI. IMPACT

POHNPEI	- 2 killed when a live power line fell and struck them.
CHUUK STATE	- declared a U.S. federal disaster area, 1000 people left homeless, major power failures.
HALL ISLANDS	- extensive crop damage, nearly all homes destroyed, all food crops destroyed.
NAMONUITO ATOLL	- extensive crop damage, nearly all homes destroyed, all food crops destroyed.
PULAP ATOLL	- extensive crop damage, 99 percent of homes destroyed.
YAP STATE	- declared a U. S. federal disaster area.
SATAWAL ISLAND	- reported winds in excess of 100 mph, 95 percent food crop destroyed, 90 percent homes damaged, all power lost.
LAMOTREK ATOLL	- reported winds in excess of 100 mph, 85 percent homes destroyed, 95 percent food crop destroyed, all power lost.
ELATO ATOLL	- 99 percent dwellings destroyed, 90 percent food crops destroyed.
IFALIK ATOLL	- dwellings - no report, 95 percent food crops destroyed, 20 percent land eroded.
WOLEAI ATOLL	- 85 percent dwellings, 90 percent food crops destroyed.
FARAULEP ATOLL**	- 20 percent dwellings, 100 percent canoes, 100 percent food crops destroyed, 20 - 30 percent land eroded.
ULITHI ISLAND	- 30 percent dwellings and government buildings, 100 percent food crops destroyed.

** NOTE: AMOS site on Faraulep was lost during passage of Owen. The shore was completely eroded away leaving the tower on its side in 10 feet of water and 20 yards off the beach. Site is now abandoned.

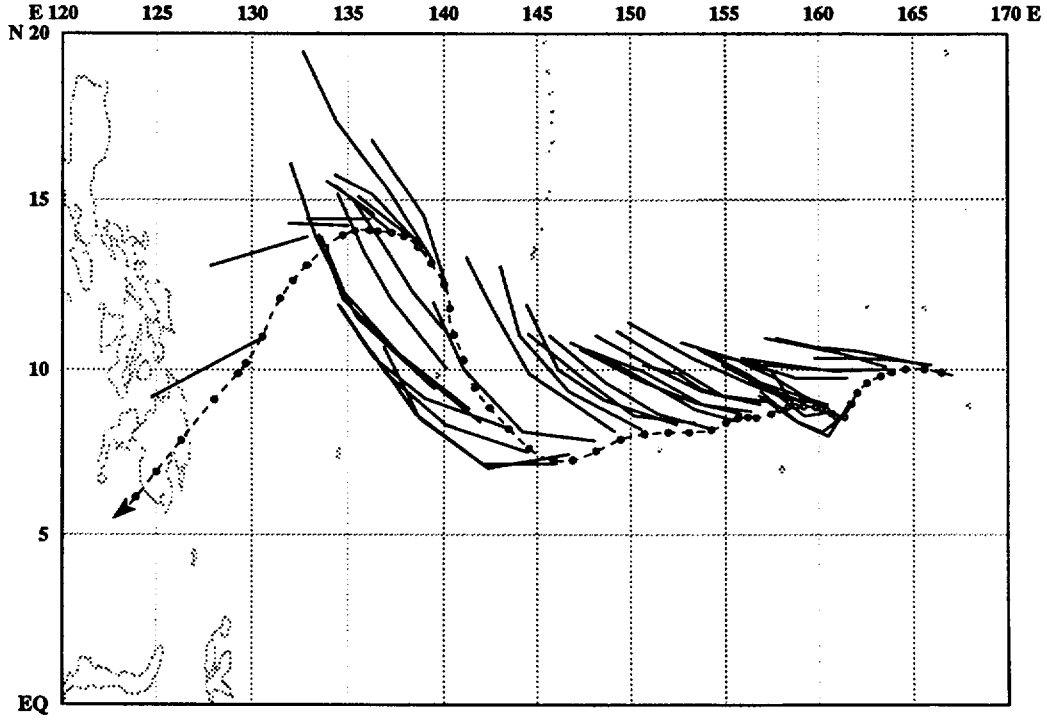


Figure 3-30-12. The JTWC forecast tracks (solid lines) for Owen superimposed on the final best track (dashed line).